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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/590,462	06/09/2000	Marco Racanelli	050324-1220	1783

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EXAMINER

DIAZ, JOSE R

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 04/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/590,462

Applicant(s)

RACANELLI ET AL.

Examiner

José R. Díaz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 17-22 and 26-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 17-22 and 26-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 June 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5, 12.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Drawings

➤ The drawings are objected to under 37 CFR 1.83(a) because they fail to show: the step of removing the region 22B from the surface of the epitaxial layer 13 as described in the specification (see Fig. 3 and page 5, lines 26-28 of Applicant's Specification). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

➤ The drawings are objected to because the Specification does not provide a description for a nitride spacer (i.e. 111A) comprised of two layers (consider the two "L" layers formed at each side of the emitter window 81 as shown in Figure 11). Furthermore, it is unclear whether the screen oxide is removed or not after the polysilicon is patterned to form the emitter electrode 121 (see Fig. 12 and page 7, lines 23-31). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

➤ The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: the reference sign 153 (see Figs. 15-16). A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the

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description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

➤ The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: the reference sign 162 (see page 8, line 23). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

➤ The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

➤ Claims 10-11 and 38-39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims are confusing since it is not clear whether the claimed invention is directed to a varactor device or to a method of manufacturing such a varactor device.

Claim Rejections - 35 USC § 102

➤ The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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➤ Claims 1-11, 17, 19-20, 22, 26-27, 29-36, and 38-39 are rejected under 35 U.S.C. 102(b) as being anticipated by Sasaki (JP 4-177770 A).

Regarding claims 1, 9, 26, and 35, Sasaki teaches a method of forming a varactor (see cols. 1-10) comprising: providing a substrate having a first conductivity type (1), providing isolation structure (6); forming a first implant (5) of a second conductivity type at a first distance; and forming a second implant of said second conductivity type at a second distance (4), wherein the second distance is greater than said first distance (see Constitution and Figs. 1 and 4).

Regarding claims 2 and 29, Sasaki teaches performing a further step of annealing (see last two sentence of Constitution).

Regarding claims 3-8 and 30-34, Sasaki teaches optimizing the varactor device by selecting a peak dopant concentration to reduce the contact resistance (see Abstract and Figs. 2 and 5).

Regarding claims 17, 20, 27 and 36, Sasaki teaches a further step of forming a contact layer (8) (see Figs. 1 and 4).

Regarding claims 19 and 22, Sasaki teaches a CMOS well (2, 3) (see Figs. 1 and 4).

Regarding claims 10-11 and 38-39, the claim(s) contain method of making characteristics given no patentable weight in determining patentability of the final device structure. Note that a "product by process" claim is directed to the product per se, no matter how actually made, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ

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90 (209 USPQ 554 does not deal with this issue); In re Marosi et al, 218 USPQ 289; and particularly In re Thorpe, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

Claim Rejections - 35 USC § 103

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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➤ Claims 1-4, 6-7, 9-11, 17-22, 26-31 and 33-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rahin et al. (US Pat. No. 5,405,790) in view of Kasahara (US Pat. No. 5,024,955).

Regarding claims 1-2, 9, 26, 29 and 35, Rahin et al. teach a method of forming a varactor device (13) (see cols. 1-14) comprising: providing a substrate having a first conductivity type (16), providing isolation structure (54); forming a first implant (66, 109) of a second conductivity type at a first distance. However, Rahin et al. fail to teach a second implant having a second distance greater than the first distance. Kasahara teaches that is well known in the art to form a varactor device by forming a dual implant region comprised of a first implant (15) and second implant (13) of a second conductivity type, wherein the second implant is deeper than that first implant; and then, annealing the first and second implants (see col. 4, lines 32-57 and Fig. 4d). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Rahin et al. to include the steps of forming a second implant region deeper than a first region, and annealing the first and second implants. The ordinary artisan would have been motivated to modify Rahin et al. in the manner described above for at least the purpose of providing a varactor having a decreased high-frequency serial resistance and an increased quality factor (Q).

Regarding claims 3-4, 6-7, 30-31 and 33-34, Rahin et al. teach do not teach optimizing the varactor device by selecting a first and second peak dopant concentrations. Kasahara teaches that is well known in the art to select a peak dopant concentration (see Equations 1-3, in which it is noted that Q depends on $N(x)$ (dopant

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concentration)) to increase the quality factor and to decrease the resistance (see col. 2, lines 19-36 and col. 6, lines 10-44). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Rahin et al. to include the step of optimizing the varactor device by selecting a first and second peak dopant concentrations. The ordinary artisan would have been motivated to modify Rahin et al. in the manner described above for at least the purpose of providing a varactor having a decreased high-frequency serial resistance and an increased quality factor (Q).

Regarding claims 17, 20, 27 and 36, Rahin et al. teach forming a contact layer (92, 112) (see Fig.22).

Regarding claims 18, 21, 28 and 37, Rahin et al. teach that first and second conductivity types (109, 16) are the same (see col. 2, lines 10-11 and col. 8, lines 64-65).

Regarding claims 19 and 22, Rahin et al. teach a CMOS well (18) (see Fig. 22).

Regarding claims 10-11 and 38-39, the claim(s) contain method of making characteristics given no patentable weight in determining patentability of the final device structure. Note that a "product by process" claim is directed to the product per se, no matter how actually made, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by

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process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

➤ Claims 5, 8 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rahin et al. (US Pat. No. 5,405,790) in view of Kasahara (US Pat. No. 5,024,955), and further in view of Morishita (US Patent No. 5,691,546).

Regarding claims 5, 8 and 32, a further different between the claimed invention and the reference Rahin et al. is the used of a secondary ion mass spectroscopy (SIMS) to determine the ion implantation conditions. Morishita teaches that is well known in the art to use an SIMS to determine the peak dopant concentration (see "Inclined Heterojunction" in cols. 19-20). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to further modify Rahin et al. to include the step of determine the peak dopant concentrations by SIMS. The ordinary artisan would have been motivated to further modify Rahin et al. in the manner described above for at least the purpose of determining the optimum ion implantation conditions.

Conclusion

➤ The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sasaki (JP- 04287978) discloses a varactor diode having a double diffused layer (see Figs 1-2). AIMI (JP 53-145578) discloses a varactor diode (See Fig. 3).

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Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00 - 5:00 Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 746-3891 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD
March 23, 2002


ALLAN R. WILSON
PRIMARY EXAMINER